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The position of a non-cooperating emitter is determined by detecting a signal from the emitter at three or more receiver communication devices positioned at different locations. The receiver communication devices determine respective detection times of the emitted signal in respective local time reference frames. To establish a common time reference frame for the emitted signal detections, each receiver communication device exchanges time synchronization signals with a reference communication device. Since any of the receiver communication devices and the reference communication device may be mobile, the signal exchange allows each receiver communication device to accurately determine the signal propagation time between itself and the reference communication device and factor the signal propagation time into an accurate adjustment of the local time reference frame. Using trilateration, the position of the emitter is determined from known positions of the receiver communication devices and the emitted signal detection times from the receiver communication devices.